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(19) **United States**(12) **Patent Application Publication****Chen et al.**(10) **Pub. No.: US 2016/0276023 A1**(43) **Pub. Date: Sep. 22, 2016**(54) **SENSE AMPLIFIER WITH INTEGRATING CAPACITOR AND METHODS OF OPERATION**(52) **U.S. Cl.**  
CPC ..... **G11C 13/004** (2013.01); **G11C 2013/0054** (2013.01)(71) Applicant: **SanDisk 3D LLC**, Milpitas, CA (US)(72) Inventors: **Yingchang Chen**, Cupertino, CA (US);  
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**G11C 13/00** (2006.01)(57) **ABSTRACT**

A non-volatile memory is described that includes a sense amplifier that maintains a bit line voltage and output of the sense amplifier at a substantially constant voltage during read operations. During a preset phase, an output of the sense amplifier that is coupled to a selected bit line is grounded. At least one capacitor is precharged during the preset phase. During a sense phase, the sense amplifier output is disconnected from ground while the memory array is biased for reading a selected memory cell. A resulting cell current is integrated by the at least one capacitor. The integrated cell current discharges a sense node from the precharge level to an accurate voltage level based on the resulting cell current.

